

REMARKS

This Amendment responds to the final Office Action mailed on May 10, 2010 and is being enclosed with a Request for Continued Examination submitted concurrently herewith. This Amendment represents a fully responsive submission, as required under 37 CFR § 1.114.

Claims 1-16 and 19-53 are pending active examination in the application. Claims 1, 2, 7, 8, 10-12, 14, 34-36, and 40 are currently amended. Claims 13 and 33 are cancelled. No new matter is added. No new claims are added.

In view of the following remarks, Applicants respectfully submit that this application is in complete condition for allowance and request reconsideration of the application in this regard.

Claim Rejection – 35 U.S.C. § 112, First Paragraph – Claims 1, 2, 12, 35

Claims 1, 2, 12, and 35 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding Claim 1, the Examiner contends the expressions “a first target CD data” and “a second target CD data” aren’t described in either the current non-provisional application or the provisional applications from which the current non-provisional application claims priority. The Applicants have deleted these expressions in the current amendment, thus, rendering the rejection moot.

Regarding Claim 2, the Examiner contends the expression “... the post-process metrology data defines an output state and comprises pre-qualified CD data for a processed substrate ...” and, in particular, the language “pre-qualified” isn’t described in either the current non-provisional application or the provisional applications from which the current non-provisional application claims priority. The Applicants have deleted the expression “pre-qualified” in connection with CD data, and amended Claim 2 to recite “... the post-process metrology data defines an output state and comprises *post-process CD data* for a processed substrate ...”, thus, rendering the rejection moot (Support for which may be found, among other places, at Paragraph [0118] of the Applicants’ specification) [Emphasis Added].

Regarding Claim 12, the Examiner contends the expression “... selecting the control recipe having a pre-determined trim value approximately equal to the difference between pre-qualified CD data and pre-qualified target CD data ...” and, in particular, the language “pre-qualified” isn’t described in either the current non-provisional application or the provisional applications from which the current non-provisional application claims priority. The Applicants have deleted the expression “pre-qualified” in connection with CD data and target CD data, and amended Claim 12 to recite “...selecting the pre-qualified control recipe having a pre-determined trim value approximately equal to the difference between post-process CD data and target CD data ...”, thus, rendering the rejection moot (Support for which may be found, among other places, at Paragraph [0118] of the Applicants’ specification).

Regarding Claim 35, the Examiner contends the expression “...determining the second delta based on the difference between CD data for the second feature and pre-qualified target CD data ...” and, in particular, the language “pre-qualified” isn’t described in either the current non-provisional application or the provisional applications from which the current non-provisional application claims priority. The Applicants have deleted the

expression “pre-qualified” in connection with target CD data, and amended Claim 35 to recite “...determining a second delta based on the difference between said nested CD data for the at least one nested feature and the target CD data ...”, thus, rendering the rejection moot.

Claim Rejection – 35 U.S.C. § 112, Second Paragraph – Claims 13, 33, 35

Claims 13, 33, and 35 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 13, the Examiner contends that the disclosure of the Applicants’ specification and set of drawings fails to teach how the binning table is created. The Applicants respectfully disagree. Claim 1, which is currently amended to include in part the claim limitations of Claim 13, recites, *inter alia*, “creating at least one binning table for a trim amount space extending between a lower boundary to establish a lower limit for trimming achievable by a series of pre-qualified control recipes and an upper boundary to establish an upper limit for trimming achievable by the series of pre-qualified control recipes, said at least one binning table divides said trim amount space into a plurality of bins, each of said plurality of bins has at least one of said pre-qualified control recipes associated therewith that achieves an amount of trimming bounded by a lower trim amount boundary and an upper trim amount boundary” (Support for which may be found, among other places, at Paragraphs [0106] through [0110] of the Applicants’ specification, and FIGs. 3 through 5 of the Applicants’ drawings). Applicants respectfully submit that the rejection is overcome in view of the current amendment to Claims 1 and 40.

Regarding Claim 33, the Examiner contends that the comparison of the isolated CD data and the nested CD data to “a target CD” is ambiguous. Claim 33 is cancelled, thus, rendering the rejection moot.

Regarding Claim 35, Claim 35 is currently amended to change its dependency from Claim 33 to Claim 1 and correct the ambiguity in “a target CD data” by amending the claim language as “the target CD data”. Thus, with the current amendment, the Applicants respectfully submit that the rejection is overcome.

Claim Rejection – 35 U.S.C. § 103(a) – Claims 1-12, 14-16, 19-23, 26, 31-33, 35, 37-44, 46-53

Claims 1-12, 14-16, 19-23, 26, 31-33, 35, 37-44, and 46-53 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al. (U.S. Patent Application Publication No. 2003/00345131) (hereinafter Verbeke et al.), in view of Reiss et al. (U.S. Patent No. 7,337,019) (hereinafter Reiss et al.). The Applicants respectfully disagree for at least the following reasons.

As currently amended, independent Claims 1 and 40 address a method and processing system, respectively, for processing a substrate by chemical oxide removal (COR), and recite, *inter alia*,

determining a *process recipe* for performing a chemical oxide removal (COR) process and a post-heat treatment (PHT) process by:

comparing the input state with the desired state, wherein the isolated CD data is compared to the target CD data and the nested CD data is compared to the target CD data,

creating at least one binning table for a trim amount space extending between a lower boundary to establish a lower limit for trimming achievable by a series of pre-qualified control recipes and an upper boundary to establish an upper limit for trimming achievable by the series of pre-qualified control recipes, said at least one binning table divides said trim amount space into a plurality of bins, each of said plurality of bins has at least one of said pre-qualified control recipes associated therewith that achieves an amount of trimming bounded by a lower trim amount boundary and an upper trim amount boundary,

correlating a first difference between the isolated CD data and the target CD data and a second difference between the nested CD data and the target CD data with a trim amount,
selecting a bin in said at least one binning table, wherein said trim amount is bounded by said lower trim amount boundary and said upper trim amount boundary for said bin, and
selecting one of said pre-qualified control recipes associated with said bin as said process recipe; and
processing the substrate to achieve the trim amount using the process recipe, the COR process including chemically treating the substrate by chemically altering exposed surface layers of an oxide hard mask on the substrate and the PHT process including thermally treating the substrate to evaporate the chemically altered exposed surface layers of the oxide hard mask. [Emphasis Added]

Independent Claims 1 and 40 are currently amended to include the sequence of steps by which a process recipe is selected using a binning table to achieve a trim amount and includes, in part, the claim limitations of Claim 13. As conceded by the Examiner, ‘Verbeke et al. does not explicitly teach a binning table (a control recipe selection method as taught by the disclosure) is used for determining the target critical data’ (see Pages 18 and 35 of the Office Action). Further, while Reiss et al. describe a control process that selects a process recipe for processing a wafer, Reiss et al. fail to teach or suggest the creation and use of a binning table to determine a trim amount.

Needless to say, neither Verbeke et al. nor Reiss et al. teach or suggest a binning table defined for a trim amount space extending between a lower boundary to establish a lower limit for trimming achievable by a series of pre-qualified control recipes and an upper boundary to establish an upper limit for trimming achievable by the series of pre-qualified control recipes, wherein the binning table divides the trim amount space into a plurality of bins, and wherein each of the plurality of bins has at least one of the pre-qualified control recipes associated therewith that achieves an amount of trimming bounded by a lower trim amount boundary and an upper trim amount boundary.

In connection with the claim language in Claim 13, the Examiner turns to Shoham et al. (U.S. Patent No. 7,042,564) (hereinafter Shoham et al.) to remedy the deficiencies of

Verbeke et al. and Reiss et al. The Examiner contends that Shoham et al. teaches ‘a method of creating a binning table using an algorithm which includes generating a reference wafer and generating a grid of bins’ (see Col. 12, Lines 49-53 of Shoham et al.). While Shoham et al. illustrates a method of dividing the surface area of a wafer into a grid of “super-pixels” or bins for inspecting the spatial variation of a polishing process acted upon the wafer, Shoham et al. fails to teach or suggest the creation of a binning table for determining a trim amount as currently recited in Claims 1 and 40.

Therefore, the Applicants respectfully submit that Claims 1 and 40 are patentable over Verbeke et al., in view of Reiss et al. (and further in view of Shoham et al.). Further, the Applicants respectfully submit that Claims 2-12, 14-16, 19-23, 26, 31-33, 35, 37-39, 41-44, and 46-53, which depend directly or indirectly from Claims 1 and 40, respectively, are patentable over Verbeke et al., in view of Reiss et al. at least by virtue of their dependency as well as for their additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claims 1-12, 14-16, 19-23, 26, 31-33, 35, 37-44, and 46-53 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 13

Claim 13 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Shoham et al. The Applicants respectfully disagree for at least the following reasons.

Claim 13 is cancelled, thus, rendering the rejection moot.

Claim Rejection – 35 U.S.C. § 103(a) – Claims 23-24, 28-29

Claims 23-24 and 28-29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Ishikawa et al.

(U.S. Patent No. 5,240,556) (hereinafter Ishikawa et al.). The Applicants respectfully disagree for at least the following reasons.

Since Ishikawa et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claims 23-24 and 28-29 depend from Claim 1, either directly or indirectly, Applicants respectfully submit that Claims 23-24 and 28-29 also patentably distinguish over Verbeke et al., in view of Reiss et al., and further in view of Ishikawa et al., at least by virtue of dependency as well as for their additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claims 23-24 and 28-29 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 25

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Wang et al. (U.S. Patent No. 5,354,715) (hereinafter Wang et al.). The Applicants respectfully disagree for at least the following reasons.

Since Wang et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claim 25 depends from Claim 1, either directly or indirectly, Applicants respectfully submit that Claim 25 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Wang et al., at least by virtue of dependency as well as for its additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claim 25 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 27

Claim 27 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Kawakami et al. (U.S. Patent No. 5,542,559) (hereinafter Kawakami et al.). The Applicants respectfully disagree for at least the following reasons.

Since Kawakami et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claim 27 depends from Claim 1, either directly or indirectly, Applicants respectfully submit that Claim 27 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Kawakami et al., at least by virtue of dependency as well as for its additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claim 27 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 30

Claim 30 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Yamazaki et al. (U.S. Patent No. 6,803,246) (hereinafter Yamazaki et al.). The Applicants respectfully disagree for at least the following reasons.

Since Yamazaki et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claim 30 depends from Claim 1, either directly or indirectly, Applicants respectfully submit that Claim 30 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Yamazaki et al., at least by virtue of dependency as well as for its additional recitations.

Accordingly, immediate withdrawal of the prior art rejection of Claim 30 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 34

Claim 34 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Official Notice Taken. The Official Notice Taken represents the Examiner's assertion that 'it is well known in the art at the time of the invention that a trimming process to reduce the dimension of a critical dimension or gate line width would increase a microchip functionality'. The Applicants respectfully disagree with the rejection for at least the following reasons.

While the Official Notice Taken suggests that it is desirable to reduce the critical dimension, it does not suggest that it is desirable to reduce the critical dimension of both isolated features and nested features by the same amount, or for that matter by different amounts. When patterning the oxide hard mask to form isolated features and nested features, as recited in Claim 1, the etching process used to perform the patterning may succumb to micro-loading which causes variations in the critical dimensions of isolated features relative to that of the nested features, thus, requiring first and second trimming processes not motivated by the desire for reduced size.

Further, since the Official Notice Taken fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claim 34 depends from Claim 1, either directly or indirectly, Applicants respectfully submit that Claim 34 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Official Notice Taken, at least by virtue of dependency as well as for its additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claim 34 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 36

Claim 36 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Chondroudis et al. (U.S. Patent Application Publication No. 2004/0071888) (hereinafter Chondroudis et al.). The Applicants respectfully disagree for at least the following reasons.

Since Chondroudis et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 1, and since Claim 36 depends from Claim 1, either directly or indirectly, Applicants respectfully submit that Claim 36 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Chondroudis et al., at least by virtue of dependency as well as for its additional recitations. Accordingly, immediate withdrawal of the prior art rejection of Claim 36 is respectfully requested.

Claim Rejection – 35 U.S.C. § 103(a) – Claim 45

Claim 45 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Verbeke et al., in view of Reiss et al., and in further view of Rice et al. (U.S. Patent No. 5,477,975) (hereinafter Rice et al.). The Applicants respectfully disagree for at least the following reasons.

Since Rice et al. fails to cure the deficiencies of Verbeke et al. and Reiss et al., as discussed above in view of the amendment to Claim 40, and since Claim 45 depends from Claim 40, either directly or indirectly, Applicants respectfully submit that Claim 45 also patentably distinguishes over Verbeke et al., in view of Reiss et al., and further in view of Rice et al., at least by virtue of dependency as well as for its additional recitations.

Accordingly, immediate withdrawal of the prior art rejection of Claim 45 is respectfully requested.

CONCLUSIONS

Consequently, in view of the amendments and foregoing remarks, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

As always, should the Examiner have any questions or deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Charge Deposit Account

Please charge our Deposit Account No. 50-3451 for any additional fee(s) that may be due in this matter, and please credit the same deposit account for any overpayment.

Respectfully submitted,

/Eric Strang/

Date: September 8, 2010

TOKYO ELECTRON U.S. HOLDINGS
4350 W Chandler Blvd., Suite 10
Chandler, AZ 85226
Tel. No.: (480) 539-2109

ERIC STRANG
Agent of Record
Registration No. 54,472
Tel. No. 480.539.2109
Fax No.: 480.539.2100